

Training Manual for State Environmental Code 1995
Chapter 2
TESTS AND EVALUATIONS

This is a session on the percolation test and the deep observation hole evaluation. The method of conducting the percolation test in accordance with Title 5 and how to determine the size of a soil absorption system, based on the results of such a test, will be discussed in detail. How and when to conduct a deep observation hole inspection and the interpretation of the findings will be examined at some length.

The session will include classroom discussion, together with video-tapes and slides of such tests and evaluations.

SUGGESTED READING ASSIGNMENTS:

Title 5: Standard Requirements For The Siting, Construction, Inspection, Upgrade, and Expansion of On-Site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage (see Subpart B- Siting of Systems).

SESSION OBJECTIVES:

By the end of the session, the trainee will be able to:

- (A) Conduct a percolation test and interpret the results in accordance with the provisions of Title 5,
- (B) Compute the size of all components of a subsurface sewage disposal system, and
- (C) Evaluate the soil and determine the elevations of ground water, and any impervious material in a deep observation hole.

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DEEP OBSERVATION HOLE

The purpose of the deep hole is to determine and record in accordance with 310 CMR 15.103, the soil profile in the proposed disposal and reserve areas and the depth of overburden above ledge, bedrock or impervious layers. It is also used to determine the observed groundwater elevation at the time of testing and to gather evidence to determine the adjusted groundwater elevation. The elevation of ground water should be determined when such ground water is at its maximum elevation. The findings of the deep observation hole are critical to the acceptance of the results of the percolation test and the location, type, size and construction of the subsurface sewage disposal system. A soil evaluator, approved by DEP, must evaluate the soils in each observation hole and prepare a soil log using a form approved by DEP. A copy of that form can be found the appendix of this manual.

According to Title 5, a minimum of two deep observation hole tests must be performed at every disposal area. The following characteristics in each hole must be properly recorded.

1. Depth and thickness of each horizon;
2. Estimated soil textural class, using USDA/SCS system of classification;
3. An estimated volume percentage of coarse fragment;
4. Abundance, size and contrast of mottling (redoxomorphic features), if present;
5. Soil structural class, and
6. Soil consistence.

In addition to these requirements the soil evaluator must indicate on the soil log whether four feet of naturally occurring pervious materials exist in all areas observed throughout the area proposed for the soil absorption system.

A minimum of two deep observation hole tests must be performed at every proposed disposal area. Additional testing may be required if, in the opinion of the soil evaluator or the approving authority, additional testing is necessary to properly assess site conditions within the proposed location to ensure that a soil absorption system can be installed entirely on soils and slopes in conformance with the requirements of the code.

Deep observation holes must be excavated in two adjoining segments, the first ending at approximately the five-foot level to allow detailed examination by the soil evaluator without need for shoring, and an adjoining segment which shall extend to a minimum depth of four feet below the bottom elevation of the proposed soil absorption system but in no case less than ten feet below existing/natural grade. The ten-foot requirement cannot be varied unless such depth is unattainable due to contact with bedrock or refusal or high ground water or where human safety may be in jeopardy.

Every deep observation hole must be located from known and recoverable reference points or benchmarks so that it may be located in the system design plan with an accuracy of one foot. The location of the hole must be defined as being half way between the side walls of the excavation at the point where the five foot deep segment adjoins the deeper segment.

It is the responsibility of the owner or agent to ensure that every deep observation hole is secured to prevent accidents whenever work is not in progress.

Location of the deep observation pits and percolation test holes must be in the areas of the proposed leaching facility and the reserve space. In selecting sites for such holes, it is important to determine the location of existing or proposed wells and sewage disposal systems on the same or contiguous lots that might not allow for minimum distances required by Title 5. Also the topography should be carefully studied to determine if the slope and drainage may present problems for the on-site system, or wells, on the same or adjoining properties.

Some boards of health find it necessary to extend the period during which deep observation holes will be examined, beyond the usual months of maximum groundwater elevation (December through April), and at the same time they make allowances for the differences in the ground water during the relatively drier months. This is a reasonable position for a board of health to take, when faced with a considerable number of requests for such examinations and a limited staff, providing such board of health has experience, or access to experience, in determining maximum ground water by other means such as soil mottling and US Geological Survey reports for determining water level.

PERCOLATION TEST

Percolation tests are intended to give an approximate measure of the soils ability to accept water. Percolation tests may be conducted at any time of the year and the data gathered, in accordance with the procedures identified in section 15.105 of the code, may be deemed valid for an indefinite period of time provided the soils within the site remain undisturbed and unaltered.

The percolation test must provide data to assess the soils ability to transmit water from the soil absorption system to a depth of four feet below it. Where the soil varies with depth the percolation test must be conducted in the most restrictive soil.

At least two perc tests must be conducted, one in the proposed primary leaching area and one in the proposed reserve area. Additional tests are required where soil conditions vary or where the system design exceeds 2,000 gallons per day. In these cases a minimum of three tests, spaced evenly over the proposed soil absorption system must be performed in addition to the test in the reserve area. Where multiple tests are conducted the slowest rate must be used for design purposes. Averaging tests is not allowed.

While Title 5 states that percolation tests may be performed at any time of the year, it is preferable to conduct such tests at the same time that the deep observation hole is

being excavated in order to determine the suitability of the soil at the leaching elevation and to a depth of four feet below this elevation. However, it is not always possible, or even reasonable, to do all percolation tests and deep observation hole examinations at the same time because of the many constraints on the lot owner, engineer, and the board of health, such as scheduling, equipment rental, and selection of a period of maximum ground water elevation for the deep observation hole examination. Many boards of health allow the performance of percolation tests year round and then conduct deep hole examinations during the months of December through April or other periods of maximum groundwater elevation. If a percolation test is performed at a time other than when a deep observation hole examination is made and the test hole is only excavated to the elevation of the leaching area, the results of such tests cannot be considered conclusive until the deep observation hole examination is made.

Percolation tests should not be conducted in frozen soil. However, a test may be performed when the elevation to be tested is below the frozen layer.

Since the approval of a percolation test requires the observation of soil to a depth of four feet below the leaching area, it is preferable that both procedures be conducted together whenever possible. One method employed by boards of health is to have the back-hoe operator excavate the hole at least ten feet deep (unless obstructed by bedrock) and then cut a "shelf" at one end of the excavation. The shelf should be cut to a depth of no more than 18 to 20 inches above the elevation at which the percolation test will be performed. The test hole should then be dug, with a hand shovel, to a depth of 18 inches in the shelf and the test conducted as stated in section 15.105 of Title 5.

Responsibility for all equipment, supplies and labor necessary for the performance of percolation tests should be borne by the land owner or developer and not by the board of health. The owner or developer must ensure that the testing soil evaluator and all equipment and supplies are on the site of the test at the time of the scheduled appointment with the board of health. Equipment and supplies should include: a back-hoe or similar equipment if a deep hole is to be dug at the same time, a hand shovel, a minimum of 24 gallons of water for each hole, a board to deflect water being poured into the hole and a small supply of coarse sand for the bottom of the test holes. Extra holes should always be anticipated and sufficient water made available for testing. The testing process is often more efficient if the test holes are dug in advance of the scheduled meeting time with the board of health. However, no hole should be exposed to the atmosphere more than three days prior to the test.

Where it is necessary to construct a subsurface sewage disposal system wholly, or partly, in fill, it is essential to perform percolation tests in the fill under conditions similar to those in naturally occurring soils. If the fill has not been allowed to settle, in place, as undisturbed soil for a period of at least 12 months such fill should be compacted before a percolation test is performed and the fill transported to the site of the proposed on site treatment and disposal system. After being transported to the proposed site, the fill should be compacted again before performing new percolation tests unless the fill has been allowed to settle at this location for a minimum of 12 months.

PERCOLATION TEST PROCEDURES-The procedures for conducting a percolation test in Massachusetts are contained in Title 5, section 15.105. There is a video available

entitled "Conducting a Title 5 Perc Test", outlining percolation test procedure for Massachusetts.